Digital Textile Solutions – Matching the Technology to the Application

Vince Cahill, VCE Solutions
AATCC/SGIA Conference
November 29, 2017
Durham, NC

©VCE Solutions 2017

Vince Cahill

- Printer for over 20 years
- Consultant and journalist for over 20 years
- Former CEO of Datametrics, owner of the Colorworks, Industrial Printing Solutions, Specialty Materials, Newhill Technologies
- President of VCE Solutions, Analog & Digital Print & Fabrication Technology and Market Consultancy: 717-762-9520
VCE Solutions & The Solutions Group

- Provides technical & marketing consulting & planning services for digital & analog printing, imaging & fabrication system manufacturers & users
- Conducts market research & analysis, monitors & evaluates technological developments, facilitates printing technology implementation & business planning
- Focuses on industrial, textile & graphic arts printing & deposition solutions, markets & public relations issues

Agenda

- What Is Digital Textile Printing
- Why Digital Textile Print
- Key Component: Printheads
- Printer Technologies
- Digital Textile Printing Applications
- Putting the Parts Together
- Trends & Conclusions
Digital Textile Printing

- The Parts: print heads, inks, pre-coats, printers, fabrics, software and finishing strategies
- Optimal combinations of these textile printing components for market applications
- Current and prospective print head technologies, printers, ink technologies, and strategies for improving performance characteristics of digital prints on the various fabric types
- Printers from low-cost spot color printer solutions to multi-million-dollar expanded gamut single-pass printers, a question of money
- Recent developments & preview of likely introductions at ITMA 2019 Barcelona

Why Digital Textile Printing

- Non-contact direct print minimizes design traps
- Cost-effective sampling, personalizing, & short runs
- Variable data, change images & colors on-the-fly
- No need for repeats
- Can limit inventory risk
- Custom tailoring & design
- Fast turns & JIT delivery
- High value added
- Photographic images
- Process color plus
- Soft signage impact
- Grand format
- Eliminates most analog pre-press need for film, screens, register & screen storage
- Reduces ink, most press start up waste & pollution & environmental impact
- Off contact, smaller traps
- All digital enables design distribute & print
- Internet sales
Inkjet vs. Screen Print Water Use

Water consumption for textile printing*:
- Rotary screen printing of reactive dye ink on a 6-color printer uses 50-60 liters of water per linear meter
- Inkjet printing of reactive dye ink for fashion designs needs 14-20 liter of water per linear meter
- The difference results in inkjet saving 60-70% of water use, screen using 3x as much
- Inkjet printing with pigmented ink uses virtually no water in pre- or post-processing

* As measured by a textile printer in Germany in 2016

Digital vs. Analog Textile Printing

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Digital Textile Print</th>
<th>Analog Textile Print</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Colors per Design</td>
<td>Millions within gamut of 4, 6, 8 process color</td>
<td>Limited to number of screen spot colors</td>
</tr>
<tr>
<td>Design Size Limits</td>
<td>X: Print width of printer Y: Not repeat limited</td>
<td>Screen size &amp; repeat X&amp;Y limited</td>
</tr>
<tr>
<td>Design Resolution</td>
<td>Up to 1200 dpi</td>
<td>~150 dpi</td>
</tr>
<tr>
<td>Ecological Impact</td>
<td>Less than analog</td>
<td>Excess dye, waste water, treatment energy use</td>
</tr>
<tr>
<td>Minimums</td>
<td>One yard or item</td>
<td>1000 to 3000 yards - meters per colorway</td>
</tr>
<tr>
<td>Down time for Changes</td>
<td>Close to zero</td>
<td>30 to 60 minutes</td>
</tr>
<tr>
<td>Strike-off/Sample Sched.</td>
<td>1 to 3 days</td>
<td>1 to 3 weeks</td>
</tr>
<tr>
<td>Print Quality Consistency</td>
<td>Can be very consistent</td>
<td>Can vary, should monitor</td>
</tr>
<tr>
<td>Single-pass Print Speed</td>
<td>Up to 75 m/min</td>
<td>Up to 50 m/min (rotary)</td>
</tr>
<tr>
<td>Multi-pass Print Speed</td>
<td>1 to 8 m/min</td>
<td></td>
</tr>
</tbody>
</table>

Chart modified & based on one from Menderes Texcil & Heimtextil-blog.com
Why Not Digital Textile

- Entry DTG is slower than screen
- Inkjet inks cost more per unit volume
- Inertia, resistance to change & capital cost
- Screen is cost-effective for long runs
- Inkjet requires very low viscosity ink
- Analog methods can print some materials and effects that inkjet cannot
- Need to climbing its learning curve

Putting Parts for Textile Inkjet

- Choosing print solution for application
- Digital design software & RIP & workflow
- Integration of drive boards, ink supply, printheads, substrate movement, fixation
- Matching ink & substrate, (precoat?)
- Profiling ink, media, printheads, RIP to achieve desired image and color results
- Monitoring printer performance & print
- In-line spectrometer? Recirculation? Aqueous tolerant? Closed or open ink?
Key Textile PIJ Inkjet Heads

- Kyocera KJ4B-0300-G06DS, KJ4B-0150
- Fujifilm Dimatix Samba, StarFire, Q-class
- Ricoh Gen 4, Gen 5
- Konica Minolta KM512i, KM1024i (water)
- Epson DX5, DX7, TFP

Other Textile PIJ Heads

- Seiko 508 GS, Seiko SPT1024GS
- Panasonic UH-HA820
- Xaar 5601, 5501, 1201

Kyocera KJ4B Recommended Use

- KJ4B-QA: Textile & document printing
- KJ4B-YH: Document & MICR printing
- KJ4B-1200: Graphics printing & high resolution applications
- KJ4B-0300: Textile Multi-pass printing
- KJ4B-0150: Sublimation multi-pass textile printing
## Kyocera KJ4B Aqueous PIJ Heads

<table>
<thead>
<tr>
<th>Model</th>
<th>No. Noz (effect)</th>
<th>Native Resol (dpi)</th>
<th>Print Width (mm)</th>
<th>Max. Freq. (kHz)</th>
<th>Max. Speed (m/min)</th>
<th>Drop Vol. (pL)</th>
<th>Ink Viscosity (cP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KJ4B-QA</td>
<td>2,656 (2,558)</td>
<td>600 x 600</td>
<td>108.25</td>
<td>30</td>
<td>75</td>
<td>5, 7, 12, 18</td>
<td>5-6</td>
</tr>
<tr>
<td>KJ4B-YH</td>
<td>2,656 (2,558)</td>
<td>600 x 600</td>
<td>108.25</td>
<td>40</td>
<td>100</td>
<td>5, 7, 12</td>
<td>5-6</td>
</tr>
<tr>
<td>KJ4B-1200</td>
<td>5,312 (5,312)</td>
<td>1200 x 1200</td>
<td>112.44</td>
<td>64</td>
<td>80</td>
<td>1.5, 3, 5</td>
<td>5.5-6</td>
</tr>
<tr>
<td>KJ4B-0300</td>
<td>1,328 x2</td>
<td>300 x 300</td>
<td>112.35</td>
<td>30</td>
<td>152</td>
<td>5, 7, 12, 18</td>
<td>5-6</td>
</tr>
<tr>
<td>KJ4B-0150</td>
<td>664 x4</td>
<td>150 x 150</td>
<td>112.35</td>
<td>30</td>
<td>152</td>
<td>5, 7, 12, 18</td>
<td>5-6</td>
</tr>
</tbody>
</table>

## Fujifilm Samba, StarFire, Q-class

**Samba** (bend mode)
- MEMS construction
- 2048 nozzles, 2pl drop
- 1200 native dpi
- Up to 100kHz
- Recirculation
- Printbar, large arrays

**Q-Class** (shear mode)
- Sapphire & Emerald
- 256 nozzles in 1 row
- Polaris 512 nozzles in 4 rows

**StarFire SG-1024/M-A** (shear mode)
- 1024 nozzles, 8 rows
- 26 to 65 pl drops, binary & grayscale
- 8 m/sec drop velocity
- Print width: 64.77mm (2.55 inches)
- Thermistor on board
**Ricoh Gen 4, Gen 5 (Piston mode)**

**Gen 5**
- 2-color MH5420 & 4-color MH5440
- Print width 54.1mm (2.1”)
  - 1,280 nozzles
  - 4 staggered rows of 320,
  - 10-12 cP
  - 7pl binary 30 kHz
  - 7-35pl grayscale 20 kHz
  - Heater & thermistor
(Also MH5220, 5421, 5441)

**Gen 4**
- 2-color MH2420 & MH2620, MH2820
- Print width: 32.4mm (1.28”)
  - 384 nozzles
  - 2 rows of 192
  - MH2610F 15pl to 27pl & MH2810F 27pl to 50pl
  - With 1-color ink flow through

---

**Ricoh GH2220**

- Piston push mode with metal diaphragm
- 384 nozzles in 2 rows of 192 for 2-color
- Viscosity range 6-16 cPs
- Aqueous & solvent ink compatible
- Print width: 32.4 mm (1.275”)
- 30kHz binary & 24kHz grayscale jetting
- Drop volume: 3-5pl binary, 4 gray levels to ~21pl max.
### Konica Minolta 512i, 1024i, 1800i

*(shear mode shared wall)*

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
</table>
| KM512 iMAB-C (aqueous) | - 512 independent nozzles (not-abc), 2 rows of 256  
- 2-color 180dpi per color  
- 360 dpi; 72mm pr. width  
- 12pl primary, 8 gray levels |
| KM1800i | - 1776 noz., 296 x 6 rows  
- 600 dpi; 80-84kHz  
- 3.5pl drop & 8 gray levels  
- 75.14mm print width |
| KM1024i SAE-C/MAE-C | - 1024 independent channels in 4 rows of 256 nozzles, 360 dpi  
- Frequency 27kHz  
- 72mm print width  
- 14pl primary, 8 gray levels  
- Aqueous ink circulation  
- Built-in heater |

### Epson DX5, DX7, 5113, TFP

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
</table>
| DX5, DX7, 5113:  
1440dpi | - TFP: Thin Film Piezo  
1440dpi  
- MEMS |
| TFP: Thin Film Piezo | - 1440dpi  
- MEMS |
| DX5 | - PrecisionCore |
| DX7 | - Micro TP |
SII 508 GS, SII RC1536 Recircul.

**SII 508 GS**
- Aqueous tolerant
- 508 nozzles
- 180 dpi native
- Binary: 28kHz
- 4 gray levels – 14kHz
- 12pl primary
- Print width 71.54mm

**RC1536 Recirculation**
- Recirculation
- 1536 nozzles in 4 rows of 384
- 360 dpi native
- 8 grey levels,
- 13pl primary drop
- 37 kHz max.
- 7 m/sec. jetting

Panasonic UH-HA820

- 600 dpi
- 30 kHz
- 3 to 14pl
- 11pl nominal
- Used on DGI Fabrijet FT-1604X & FT-3204X printers
Xaar 5601, 5501, 1201

- Xaar is aiming at aqueous ink applications, including textile printing, with its new line of water tolerant PIJ heads
- D.gen offers its Papyrus 740K dye sublimation printer with Xaar 1201 PIJ heads
- Newly launched 5501 has a 115mm print width

<table>
<thead>
<tr>
<th>Printhead</th>
<th>Printers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ricoh Gen4</td>
<td>Mimaki TX400</td>
</tr>
<tr>
<td>Ricoh Gen5</td>
<td>Mimaki TX500; dGen Televios, Arachne; Mtex 5032 HS, Vision, 500 C &amp; P; Oric TX1804-E, TX3202-E, TX1804-G, TX3209 &amp; 3206-G; Flora TX series, T-100, LJ200T</td>
</tr>
<tr>
<td>Ricoh GH2220</td>
<td>FabricZoom; Oric TX3750-GH, TX6360-TG; Grando printers; IQDemy Speedster GH2220</td>
</tr>
<tr>
<td>Epson DX-5</td>
<td>Mimaki JV-33, JV-5, Mutoh RJ-900</td>
</tr>
<tr>
<td>Epson DX-7</td>
<td>Roland XF-640; Mutoh 1638</td>
</tr>
<tr>
<td>Epson T2 Micro PIJ</td>
<td>Epson-Robustelli Monna Lisa</td>
</tr>
<tr>
<td>Fujifilm Dimatix Samba</td>
<td>SPG Prints Javelin &amp; Pike; Flora Textra; HopeTech BD01 &amp; BD02</td>
</tr>
<tr>
<td>Fujifilm Dimatix Starfire SG-1024</td>
<td>Zimmer Colaris3 DX, Tacome KeraJet TS7, Pyung An’s wide-format; HopeTech BD01, BD02, HF01, HF02, HF03</td>
</tr>
<tr>
<td>Fujifilm Dimatix Q-class</td>
<td>Kornit Allegro, (DTG line)</td>
</tr>
</tbody>
</table>
Textile PIJ Heads & Printers (cont.)

<table>
<thead>
<tr>
<th>Printhead</th>
<th>Printer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seiko 508GS</td>
<td>Ichinose 2030, Ftex JS-BT-180</td>
</tr>
<tr>
<td>Seiko SPT 1024GS</td>
<td>Zimmer Colaris Infiniti SK</td>
</tr>
<tr>
<td>Panasonic UH-HA820</td>
<td>Mtex Blu Neo &amp; K, Mimaki TS300P</td>
</tr>
<tr>
<td>Konica Minolta KM Single-pass</td>
<td>Konica Minolta SP-1</td>
</tr>
<tr>
<td>Konica Minolta KM 1024i</td>
<td>Nassenger 10, 8, Pro 1000, Pro 120</td>
</tr>
<tr>
<td>Konica Minolta KM 512i</td>
<td>Nassenger Pro 60</td>
</tr>
<tr>
<td>Xaar 1201</td>
<td>d.gen Papyrus 740K</td>
</tr>
<tr>
<td>Kyocera KJ4</td>
<td>MS JP-series, LaRIO; EFI-Reggiani ReNOIR series; Aleph; Atexco Vega One; Fiora T-180; HopeTech BD01, BD02, HF01, HF02, HF03; Miyakoshi MTP</td>
</tr>
</tbody>
</table>

Digital Textile Printing Categories

- **IJ Direct to Fabric**
  - Pigment
  - Acid dye
  - Reactive dye
  - Disperse dye
  - Other
- **Indirect/Transfer**
  - Dye sublimation
  - Electrophotography
  - Thermal transfer (TT)
  - Plotter-cut
- **Direct to Garment (DTG) Inkjet (IJ)**
  - Pigment
  - Other
- **Digital-Analog Hybrid Systems**
  - DTG screen + inkjet
  - Other

Image sources: [http://digilogic.co.uk](http://digilogic.co.uk) [http://www.fibre2fashion.com](http://www.fibre2fashion.com)
Textile Single-pass Inkjet

- MS: LaRIO
- SPG Prints: Pike
- Konica Minolta: SP-1
- Flora Teextra
- HopeTech BD01 & BD02
- Atexco: Vega One
- PyungAn Narrow & Wide Format
- KERAjet Textile TS7, (TP7)
- Swiss4Tex AG Prototype

MS Printing Solutions SRL

LaRIO

- First sign-pass 2010
- Kyocera KJ4B
- 600 dpi, 4 to 72pl
- Up to 35 lin. m/min (8 col.)
- Up to 75 lin. m/min (4 col.) = 45,000 lin. m/hr
- Up to 320 cm print width, prints textile & paper
- Over 22 LaRIOs have been placed worldwide
- Uses acid, reactive, disperse dyes
- Open ink & software systems
- Embedded remote diagnostics
**SPG Prints PIKE**

- Single-pass 1.85m wide
- 32 kHz drop frequency
- 40-75 linear m/min, 3-10 million m+/year
- 65K – 210K liters ink/year
- Fujifilm Samba PIJ print head arrays, 4mm throw
- Archer Print bar with 43 Samba heads per color
- 1200x1200 dpi native
- Variable drop 2 to 10pl
- Ink price covers heads
- CMYK + Orange & Blue 6-color system, (9-color for 2016)
- 9-color version to feature fabric penetration fluid
- SPGPrints PIKE uses reactive, acid & disperse dye inks

**Konica Minolta**

**Nassenger SP-1**

- Single-pass; KM-1800i
- 4, 6 & 8 color systems
- Print widths, 1.6m & 1.83m
- Reactive & disperse dye ink sets
- 6,400m²/hr at 720x360dpi
- 4,300m²/hr at 720x540dpi
- 3,200m²/hr at 720x720dpi
- 2,500m²/hr at 720x900dpi
- Errors detection-correction
**Atexco Vega One**

- Print head: Kyocera PIJ
- Drop volume: 4 to 30 pL
- Print speed: 80 linear meters/minute
- Prints acid, reactive, disperse dye inks
- Introduced at ITMA Milan November 2015
- Still in development
- Atexco promotes its scanning head textile solutions

---

**Flora Textra**

- Print width: 1730 mm
- Fujifilm Dimatix Samba Printheads
- 1200 x 1200 dpi
- 2.4pl to 13.25pl grayscale
- 40 to 70 m/min print speeds, Flora claims a maximum speed of 120m/min
- For direct textile & indirect dye-sub paper
- Supports 1200mm diameter rolls
HopeTech BD01 & BD02

- 8-colors
- Print speeds: 40 to 75 m/min
- Print Width: BD01 = 1.8m, BD02 = 2.6m
- Choice of PIJ heads: Kyocera KJ4B-QA06 (600dpi, 5-12pl), Dimatix Samba (1200dpi, 2.4-13.2pl) or Starfire SG-1024 (400dpi, 7-160pl)
- Reactive, Acid, Disperse, Pigment, as well as UV, & Solvent inks
- Prints textiles directly, dye-sub transfers, paper & cloth wallcovering, & wood board

Pyung An

- Paco Pro-1 wide format roll-to-roll
- Fujifilm Dimatix Starfire SG1024
- Pyung An narrow format
- Fujifilm Dimatix Samba
KERAjet Textile TP7 (Where is TS7?)

- KERAjet Textile TP7 2400 & 3200 are high productivity textile inkjet printers
- 400 up to 1200 dpi, 15pl to 75 pl drop size
- 12 colors, up to 6 heads per color
- KERAjet’s single-pass inkjet ceramic skills
- Fujifilm Dimatix Starfire SG1024 PJ heads
- TP7 2400: 660m/h (monodirect) 1320m/h (bidirect)
- TP7 3200: 840m/h (monodirect) 1680m/h (bidirect)

Swiss4Tex

- www.swiss4tex.com
- Swiss4Tex AG, Löwengasse 8, CH-4500 Solothurn, Switzerland; Phone: +41 79 3303461
- “Our mission is to deliver a series of digital inkjet presses that will enable the textile printing market to move to the next stage of production technology.”
- RADEX AG (Rapid Development Experts) · Hofweg 28, CH-2540, Grenchen, Switzerland; www.radex-net.com; Phone: +41 79 3303461
**RtR Direct Scanning Inkjet**

- MS JP5 EVO, JP6, JP7, JPK Evo, Impres series
- EFI-Reggiani One 180, Pro & Top 180 & 340, ReNOIR series
- SPG Prints Javelin
- Aleph LaForte® (Fabric)
- Mimaki TX series
- d-gen Teleios, Artrix & Arachne series
- Durst Rhotex
- Epson-Robustelli Monna Lisa
- La Meccanica Qualijet
- Konica Minolta Nassinger Line
- Kornit Allegro
- Mutoh
- Roland
- Toshin Kogyo Ichinose 2050
- Zimmer Colaris

---

**MS Scanning Direct to Textile**

<table>
<thead>
<tr>
<th>Printer</th>
<th>Textile /Paper</th>
<th>Print Width cm</th>
<th>DPI</th>
<th>No. of Printheads</th>
<th>Print Speed lin. m/h=L sq. m/h=S</th>
<th>Gray Levels</th>
<th>Drop Volume pl</th>
</tr>
</thead>
<tbody>
<tr>
<td>JPK evo</td>
<td>T/P</td>
<td>320</td>
<td>600</td>
<td>Up to 32</td>
<td>L 300-460</td>
<td>16</td>
<td>4 - 72</td>
</tr>
<tr>
<td>JP7</td>
<td>T/P</td>
<td>180</td>
<td>600</td>
<td>Up to 16</td>
<td>L 170-290</td>
<td>16</td>
<td>4 - 72</td>
</tr>
<tr>
<td>JP6</td>
<td>T</td>
<td>180</td>
<td>600</td>
<td>Up to 8</td>
<td>L 100-180</td>
<td>16</td>
<td>4 - 72</td>
</tr>
<tr>
<td>JPS evo</td>
<td>T/P</td>
<td>180</td>
<td>600</td>
<td>Up to 4</td>
<td>L 55-100</td>
<td>16</td>
<td>4 - 72</td>
</tr>
<tr>
<td>JP4</td>
<td>P</td>
<td>180</td>
<td>600</td>
<td>Up to 4</td>
<td>S 155-180</td>
<td>16</td>
<td>4 - 72</td>
</tr>
<tr>
<td>JP3</td>
<td>P</td>
<td>180</td>
<td>600</td>
<td>Up to 2</td>
<td>S 95-120</td>
<td>16</td>
<td>4 - 72</td>
</tr>
</tbody>
</table>

- Open ink system
- Open software
- Embedded remote diagnostic
- Embedded web server for cost report
- All Kyocera KJ4 PIJ heads
Konica Minolta Nassenger

**Nassenger Pro 1000**
- 81 KM 1024i PIJ heads
- 360 npi
- 1000m²/hour at 540 x 360 dpi (Scanning)
- Reactive, disperse, acid dye inks
- 2 20-liter ink tanks for each of 9 colors
- Wrinkle-detection
- Concave nozzle surface prevents head strikes

9-Color Textile Printers

**KM 1024i PIJ Heads**
- Nassenger 10 (1.85m)
  - 60m² – 980m²/hour
- Nassenger 8 (1.85m)
  - 30m² – 380m²/hour
- Nassenger Pro 120 (1.8m)
  - 40m² – 120m²/hour

**KM 512 PIJ Heads**
- Nassenger Pro 60 (1.8m)
  - 9m² – 60m²/hour

EFI Reggiani

**ReNOIR Plus**
- Includes 3.4 m version
- Kyocera PIJ heads
- Kevlar blanket
- Embedded dryer
- Tens of units placed

**ReNOIR Compact**
- Kyocera PIJ heads
- 8 to 32 Kyocera PIJ heads, 4-8 colors
- 4-72 pl. grayscale
- 1.85 m max. print width
- 600x600dpi at~150m/hr
TenCate

Reggiani ReNOIR with diagonal scanning
- Kyocera KJB arrays
- CMYK+W & spot colors
- 1200 dpi
- 600 lin. m/hour

TenCate Osiris
- Markem-Imaje CIJ
- Single-pass
- 8 to 12 print colors
- 18-30 lin. m/min
- 1.8m print width (max 3.2m)
- 3,300 m²/hour (1.8m wide)
- Reactive, acid, disperse dye (VAT dye soon)

Robustelli Monna Lisa

- Epson acquired Robustelli July 2016
- New Monna Lisa 180 48T debuted at ITMA 2015
- Installed at large Como, Italy textile printer
- Uses 48 Epson T2 PIJ heads, 1440 nozzles arranged in 8 rows of 180 each

- Each head has 8 ink channels & can print 8 colors at 180 dpi or 4 colors at 360 dpi
- Robustelli offers Monna Lisa models as ML 180, 220 & 320cm widths
Durst Textile Printers

Kappa 180 V2
- 1.95m print width
- 580m²/hr at 800 x 600 dpi; 1000 x 600 max res.
- 32 QuadroZ V2 PJ (Ricoh) 8-ink channel mirrored heads
- 6144 nozzles per color & droplet sizes of 7-21 pl.
- Corino fabric feed
- Aqueous disperse, acid & reactive dye inks
- Drier unit

Rhotex 180 TR
- Aqueous CMYK dye sublimation
- 1.85m print width
- 100 m²/hr high quality
- 200 m²/hr production
- Sportswear, T-Shirts, Accessories, Bed Linen, Upholstery, Table Cloths, Flags, Wall Decorations, Outdoor Advertising
- 800 x 600dpi to 1200 dpi

Kappa 320
- 3.3m print width

La Meccanica

Qualijet Tiger 88
- 16 KJ4B PJ heads 600 x 600 dpi native resolut.
- 16 Grayscale levels 4-72 pl drops
- 1.8, 2.4 & 3.4m models
- Acid & reactive dye inks
- 125m/hr 2-pass 18pl drop to 290m/hr 1-pass 12 pl drop

Qualijet Leopard 8
- 8 KJ4B PJ heads
- 600 x 600 dpi
- 78m/hr 2-pass 18pl drop to 163m/hr 1-pass 12 pl drop

Qualijet R500B
- 1.83m Print width (max)
- 6 – 1280-nozzle Ricoh PJ heads (320 nozzles x 4 rows)
- Adjust print head-substrate: 1.5-7mm
- Resolutions: 300 - 450 - 600 - 900 - 1200 dpi a 6,8,12,16 pass
- Adhesive blanket – Twin roll
- Print speed (See attachment)
- Acid dye inks – Mimaki certif.

Qualijet HS JV5 Series
- Epson 1440-nozzle PJ heads
- Acid, reactive, disperse and sublimation inks
**Mimaki Textile**

Mimaki
- TS34-1800A, TS500-1800, 30m²/hr (6-8 color best quality) to 99m²/hr (4-color fast print)
- TX500-1800B: 23m²/hr (6-8 color best quality) to 140m²/hr (4 color draft mode)
- TX500-1800DS, dye sublimation
- TS300P-1800 Dye sublimation transfer paper printer with Panasonic printheads
- TX300P-1800 Direct to fabric Panasonic printhead printer
  - 5 ink types: disperse, reactive, sublimation, acid dye inks, & pigment
  - Up to 7mm throw distance

**d-gen**

- Ricoh Gen5 PLJ heads
- Teleios Grande H6 & G5: 74m²/hr (best) to 190m²/hr (draft)
- Teleios Hexa: 6-color direct disperse dye for soft signage
- Artrix H8 & G5: Pigment, acid, reactive, disperse
- Arachne Hexa: Pigment, acid, reactive, disperse dye ink on cotton, rayon, polyester & blends
Kornit

Allegro
- 1.8m max. print width
- NeoPigment™ process
- 64 Fujifilm Polaris PIJ heads, 7 colors (CMYK + Red, Green, Gray)
- Inline ink fixation agent
- Multiple fabric types
- Rich color & light hand

RtR Transfer Scanning Inkjet
- Aleph LaForte® (Paper)
- Roland RT & XT-640
- Epson SureColor F9370
- Mutoh ValueJet 2638
- Mimaki TS500P-3200, TS300P-1800, TS30-1300, TS500-1800
- d-gen Papyrus G5
- Durst Rhotex 180TR
- EFI FabriVu
IJ Direct to Garment (DTG)

- Epson
- Brother
- Ricoh Anajet
- Belquette
- M&R
- DTG
- Kornit
- Aeoon
- Roq
- Texjet
- FreeJet
- Resolute DTG

Kornit Vulcan

**Vulcan**
- Max. print size 70x100 cm / 27.5x39.5 in.
- Max. 250 garments/hr.
- Dark & light garments printed at same speed
- 60 PIJ recirculation heads
- Six colors plus white
- NeoPigment™ process
Kornit DTG

**Avalanche 1000**
- 300 light A3 size garments/hr
- Dual pallets
- 23.5 x 35 in print area for XXL garments and cut pieces
- NeoPigment™ process
- 5 colors + Integrated automated pretreatment
- 24 Fujifilm Polaris™ PIJ heads, 256 nozzles each

**Avalanche Hexa**
- 20 Fujifilm Polaris™ PIJ heads, 256 nozzles each
- 250 light garments/hr max
- 140 dark garments/hr max

**Avalanche DC Pro**
**Avalanche Storm II**
**Breeze**
**Paradigm II**
- Inkjet screen print add-on

Aeoon Kyo

- 4 to 12 Kyocera PIJ native 600 dpi heads
- 2558 nozzles/head & firing at 40kH max
- 2 or 3 print table axes
- Pallets standard sizes (ranging from 25 x 35 cm up to 100 x 200 cm) as well as custom sizes
- Aeoon claims up to 800 T-shirts per hour (A4 print size)
Hybrid Solutions Arriving

DTG Inkjet-Screen Hybrids:
- Kornit Paradigm II
- M&R Digital Squeegee®
- ROQ Hybrid

DTG Overview
- Inkjet DTG estimated to be about 6-7% (2014) of non-transfer garment printing
- Projected to grow about 15% per year for a 1 to 2% increase in market share
- Workflow software necessary for profit
- Web-to-print sales with on-line design
- ROI: 6 to 12 months
- Pretreatment needed to improve color, adhesion, mediate fabric-ink energy & prevent ink soaking into fabric
- White underlayment needed for printing color on other than white or very pale garments
Digital Textile Printing Applications

**Traditional Categories**
- Garments & Uniforms
- Apparel accessories
- Flexible signage, flags & banners
- Cover temporary & permanent structures
- Wallcovering
- Home textiles
- Carpeting
- Textile packages & bags

**Non-Traditional**
- Smart textiles, energy harvesting & sensors
- RFID Tags & NFC
- 3D fabrication
- 3D fashion
- Filters
- Trans-dermal dosing
- Automotive upholstery
- Gaming table covers

Fashion 2D Prints

First2Print NYC & LA

Digital Service Bureaus

Costume
Swimwear
Interiors
Soft Goods
Activewear
Accessories
Apparel
Arts & Conservation
Promotional

Sano Design Services

- Sano Design Services – NYC
- 24-48 hour turn around service - 1 yard minimum order.
- Select from over 100 fabrications for Accessories, Apparel, Gifts, Home and Special Event printing and Product Finishing.
- Precise color matching services available - Print 36", 44", 60" & 120" wide with our fabrics.
- Small & production fabric printing services in USA, China, Korea and Taiwan.
- Test prints for just $8
Digital 2D Print Service Bureaus

- Primarily located in or near NYC & LA design centers
- Most offer design services
- Textile Arts Marketing Inc.
- Saxon Textile
- Rosekei & Company
- Lectra USA, Inc.
- The Style Council
- DigiFab Systems
- Inkjet Textile Printing
- L.T.S. Design Service
- Spoonflower

Digital Print Design

- Expands design possibilities
Expand Application Possibilities

- Curtains
- Upholstery
- Bedding
- Lamp shades
- Leather
- Promotionals
- Automotive upholstery
- Umbrellas
- ...

HY-Fabric: Curtains

First2Print: Interiors & Upholstery

BBO Gaming Tables

Soft Signage, Flags & Architecture

Image sources: artsigndesign.com, ST Media Group, servicegraphics.co.uk, JV Digital Printing
Trends

- Web-to-print
- Decreases in production run lengths per color way
- Digital textile printers achieving larger cost-effective run lengths
- Market demand for greater design variety
- Decline of retail/growth of Internet sales
- Shorter production cycles
- 3D enhancements
- Smart fabrics
- Reduced inventory risk

- Shipping time & cost
- Sustainability
- Single-pass
- Growth of Asian print production
- In-head ink recirculation
- MEMS, larger & faster printheads: Kyocera KJ4B-Z, Fujifilm Dimatix SureFire & Samba, Ricoh Gen4L and Gen5, Epson PrecisionCore, Xaar & Konica Minolta MEMS PIJ
- HP, Canon, & MEMjet, TIJ ???

Conclusions

- Digital 2D & 3D printing technologies & textile fabrication methods are changing how textile products are designed, printed & made
- Textiles are becoming smart for medical, athletic wear, industrial use, architecture, public safety, industrial & military personnel
- The number and kind of textile print applications are growing
- The speed to market of digital print & internet sales are driving textile printers to adopt
- Next hurdles: automating sewing, eliminate dye finishing water waste, accurate color delivery
Thank You

For additional information from the Solutions Group:

- Vince Cahill: vince@vcesolutions.com
- Dene Taylor: dene@spf-inc.com
- Patrice Giraud: patrice@vcesolutions.com